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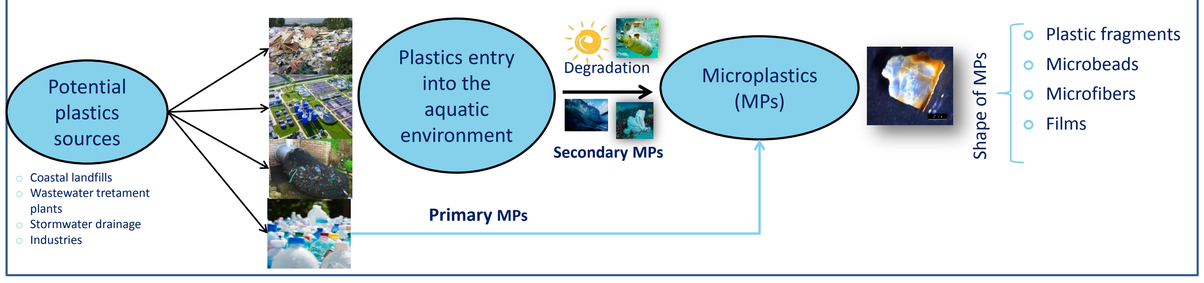
Assessment of wastewater treatment plant and coastal landfill as important microplastics pathways in the marine environment

Maria KAZOUR[a,b], Sarah TERKI[a], Khalef RABHI[a], Rachid AMARA[b]

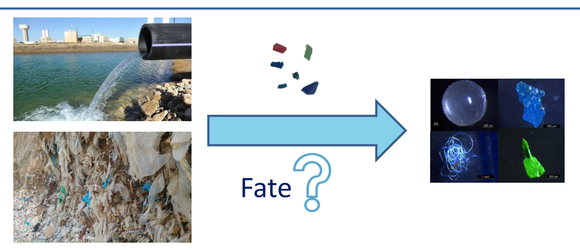
[a] Univ. Littoral Côte d'Opale, CNRS, Univ. Lille, UMR 8187, LOG, Laboratoire d'Océanologie et de Géosciences, 32 Avenue Foch, Wimereux, France
[b] CNRS-L, National Center for Marine Sciences, PO Box 534, Batroun, Lebanon

Context

- Marine Plastic debris have been tremendously increasing since the last decade
- Entry routes of microplastics (MPs; Plastics of a size between 1 µm and 5 mm) into the marine environment not well known



Objectives

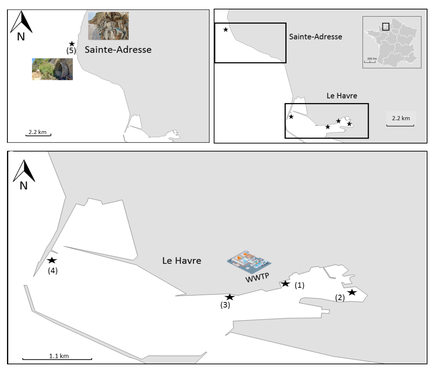


- **Role** of a municipal wastewater treatment plant (WWTP) effluent and an abandoned coastal landfill as pathways for microplastics (MPs) input into the marine coastal environment.
- **Follow** the MPs released by WWTP in the marine environment along a distance gradient in three compartments (sub-surface water, sediments and mussels).

Materials and Methods

1. Study zone and sampling sites:

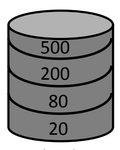
- Edelweiss WWTP
- Le Havre Harbor
- Sainte-Adresse



2. Sampling methods:

a. Water filtration

- Filtering system consisting of a water pump connected to a flowmeter
- Stainless steel sieves of different mesh sizes of 500 µm, 200 µm, 80 µm and 20 µm
- density separation using $ZnCl_2$ (d= 1.8 g/cm^3)

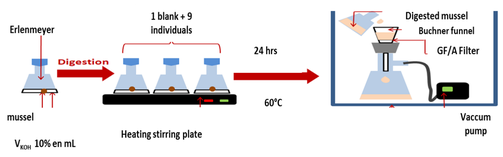


b. Sediments

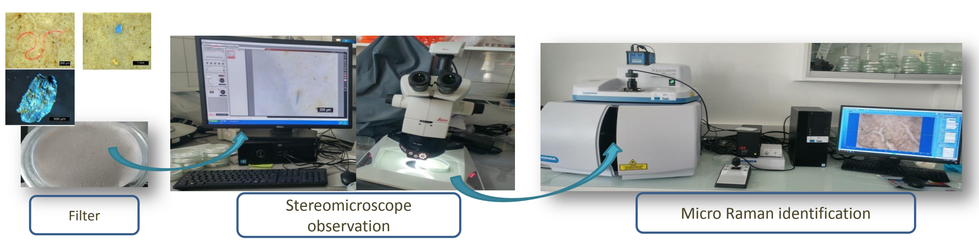
- Sediment samples were collected
- Treatment under H2O2 and density separation using $ZnCl_2$

c. Wild mussels

- 20 individuals of *Mytilus sp.* were collected
- Mussels were digested using KOH 10%



3. Microplastics analysis



Size, color and polymer type

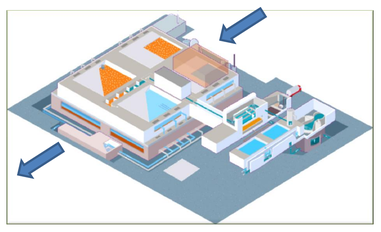
Results

1. WWTP, surface water and sediments

- Microplastics retention : 98.83%.

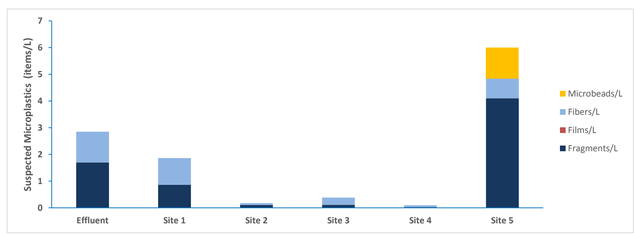
Influent: 244 items/L

Effluent: 2.84 items/L



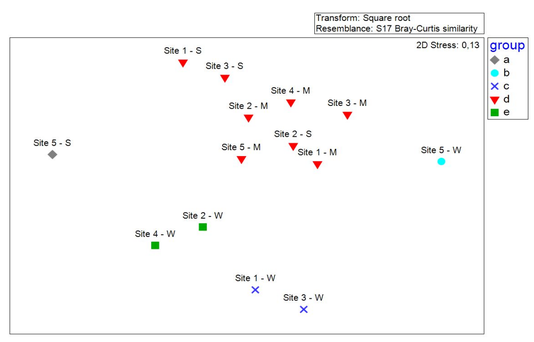
- Microplastics decreased with increasing distance from the WWTP
- Higher concentration in site 5 (next to the coastal landfill).

- Mussels from site 5 ingested a significantly higher number of suspected MPs (2.75 ± 3.08 items/g).



2. Microplastics similarity

- 13 types of polymers were identified using micro-Raman spectroscopy.
- A similarity in polymers composition between mussels and sediments was observed except in site 5.



Discussion and Conclusion

- The WWTP has a retention efficiency of 98.83% but yields to a daily discharge 227 million MPs

- We highlight the importance of coastal landfills as important MPs sources

- Mussels are prone to ingest small microplastics (< 200 µm) and show a polymer similarity to that of sediments: promising sentinel species for small MPs.